

Inelastic Interaction and Non-Traveling-Wave Effects for Two Multi-Dimensional Burgers Models from Fluid Dynamics and Astrophysics with Symbolic Computation

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Describing the surface perturbations of a shallow viscous fluid, cosmic-ray-modified shock structures and electromagnetic waves in a saturated ferrite, the (2+1)- and (3+1)-dimensional Burgers equations are investigated in this paper. In view of the higher space dimensionality, the transformations from such two models to a (1+1)-dimensional Burgers equation are constructed with symbolic computation. Via the obtained transformations, three families of multi-dimensional N -shock-wave-like solutions are specially presented, which recover some previously published solutions. The inelastically interacting properties and some non-traveling-wave effects of shock waves are discussed through the figures for several sample solutions. Additionally, possible applications for those solutions and effects in some fields are also pointed out.

Key words: Multi-Dimensional Burgers Equations; Inelastic Interaction; Non-Traveling-Wave Effects; N -Shock-Wave-Like Solutions; Symbolic Computation.